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ABSTRACT

A study investigated the effects of selected psychophysiological factors known to affect cognitive functioning on the reading achievement of older adults. The subjects, 34 noninstitutionalized adults ranging in age from 50 to 88 years, completed measures of (1) self-reported mental and physical health, (2) nonverbal intelligence, (3) reading interests and attitudes, (4) state and trait anxiety, and (4) functional reading ability. They also supplied biographical data. Results showed that for the subjects, self-assessed mental and physical health and nonverbal intelligence were significant contributors to functional reading achievement. Sex, age, socioeconomic status, reading attitude, and state and trait anxiety did not contribute significantly to the variance of the reading test scores. The results indicate that aging "per se" does not affect cognitive functioning as it relates to functional reading ability. (FL)

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The Influence of Psychophysiological Variables on Aged Subjects' Function Reading Achievement

by

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Influence of Psychophysiological Variables on Aged Subjects' Functional Reading Achievement

Reading researchers have attempted to measure reading interests and functional abilities of students from kindergarten through post-secondary levels; researchers have been particularly interested in the relationship of extraneous variables to reading ability. Few studies, however, have examined the effects of mental and physical factors on reading achievement of aged adults (Kingston, 1973; Robinson and Maring, 1976; Lovelace, 1977; Lovelace, 1978). This study was designed to investigate the effects of selected psychophysiological factors known to affect cognitive functioning, on reading achievement among the active, noninstitutionalized aged.

Approximately 22 million Americans, more than 11 per cent of our total population, will be 65 years of age or older by the year 1980 (Kingston, 1977). Chronological age is one of the most common factors mentioned as affecting intellectual and reading capabilities. The belief that increase in age per se has a degenerating effect on mental performance and reading ability (Thorndike and Galleys, 1944; Guilford, 1967; Birren, 1974) has been challenged in recent years. Goldstein and Shelly (1975) examined the similarities and differences between psychological losses due to aging and those due to brain damage and concluded that mental decline cannot be referred to as a result of chronological aging in a global way. Similarly, Rabbit (1965) and Granick, Kleban and Weiss (1976) summarized from their investigations that intelligence apparently is not a major factor affecting reading performance among the aged.

The improvement of measurement of cognitive performance, including functional reading achievement is dependent, to a large extent, upon investigators' abilities to separate contextual effects from essentially age-related changes. Previous gerontological research suggests that the following physiological and psychological aspects should be considered and

controlled in the research design of studies involving the aged: general health, age, sex, vision, auditory acuity, intelligence, response time; psychological cautiousness and anxiety; motivation; and general life situational factors, including socioeconomic status, educational attainment level, and ethnic group affiliation (Lovelace, 1978).

In addition to sampling problems, the selection of a normed instrument also presents some barriers to the accurate measurement of cognitive ability among the aged, as reflected in terms of functional reading performance. Items reflecting real life situations appear to be more appropriate indicators of functional ability than are items focusing on liberal arts passages and literary knowledge. While a survey of reading tests revealed no test normed on a randomly-selected aged population, certain items developed by the National Assessment of Educational Progress (Hazlett, Ahmann, and Johnson, 1973) were presented to young adults (aged 26-35).

Kirsch and Guthrie (1977-78) examined the recent literature as it relates to the concept of functional literacy and its measurement. They noted that NAEP items developed to measure reading comprehension encompass a range of behaviors which include the abilities to understand word meanings, to glean significant facts, to comprehend the main idea, and authors' organization, to draw inferences and to read critically. Items were administered to a national sample of 17-year-old students enrolled in school in 1974; results are tabulated by region, sex, race, parents' education, and size and type community. Kirsch and Guthrie commended NAEP for providing a major effort towards specifying expected behavior or performance. While some adults responded to the items, no aged Americans participated in the study.

The investigators selected certain NAEP items to be used as a measure of functual literacy in this pilot study. If the items successfully discriminated between good and poor aged readers, then a national norming study might be conducted. Independent factors which might potentially

contribute to subjects' variance in reading scores included sex, age, socioeconomic status (based on education and occupation prior to retirement), self-reported mental and physical health, non-verbal intelligence, reading behavior/attitude, and state/trait anxiety.

Method

Thirty-four noninstitutionalized subjects ranging in age from 50-88 years, and living in Lafayette, Louisiana, comprised the sample. Many of these subjects attended church-related retirement groups. Of the 34 subjects, 27 were female and 7 were male. Socioeconomic status of the group ranged from an index of 11 (high upper class) to 69 (low middle class), with an average socioeconomic status of 38 (middle class), as determined by Hollingshead's Index of Socioeconomic Status (1958). All respondents reported that they had completed at least a high school education; many stated that they had also earned a college degree.

The investigators, with the assistance of a trained graduate research assistant, explained the purpose of the investigation to the subjects in a general session, and described the directions for completing all the instruments. A coded packet, containing copies of each instrument, was supplied to each person; a cover letter was included in the packet, reiterating the directions for completion of each task. The 34 subjects were allowed to take the packets home and to work on the instruments at their leisure; packets were returned to the investigators at the end of one week. The investigators hoped that, since the subjects were allowed to work in familiar surroundings at their own pace, the effects of psychological cautiousness and state anxiety would be minimized. Subjects indicated that the tasks had been completed without assistance. As most subjects belonged to church-related retirement groups. and were very much aware of the need for accurate measurement, the investigators assumed that subjects received no

assistance with these task; no evidence of collusion was noted in raw scores.

Each packet contained:

1) The Cornell Index (Weider, Wolff, Brodman, Mittelmann, and Wechsler, 1948), which was included to assess subject self-reported health (mental and physical). Though copyrighted in 1948, the Cornell Index is normed and is a valid method of surveying adults' self-reported health.

2) A questionnaire on biographical data (age, sex, education and occupation prior to retirement).

3) Raven's Standard Progressive Matrices (1962), used to determine nonverbal intelligence. The matrices are untimed and the task itself is nonthreatening to most adults.

4) Mikulecky's Behavioral Reading Attitude Scale (1976), assessing subjects' reading interests and reading-related behavior. This scale is designed for use with adult populations.

5) Speilberger's State-Trait Anxiety Index (1970), measuring task (state) anxiety, and long-term (trait) anxiety. The STAI is a group measure and is normed on an adult population.

6) A 40-item reading test, used to measure the dependent variable, functional reading ability. The items were catagorized in five subtests: visual reading of signs, reference materials, facts, main ideas, and inferences.

Analyses and Results

The means, standard deviations, variance of subjects' responses to each measure are reported in Table 1. Subjects, as a group, averaged 69 years of age, middle-class socioeconomic status, in the 70th percentile of nonverbal intelligence, and possessed a positive reading attitude. Physical health, as reported by the subjects, was, on the average, still good, though anxiety about health was high and some loss of vision and hearing was reported.

Table 1
Means, Standard Deviations, Variances, and Numbers of Aged Subjects Responding to 14 Variables

Variable	Mean	Standard Deviation	Variance	Number
Age	69.43	8.38	70.22	33
Socioeconomic Status	38.00	17.57	308.70	30
Medical Index	8.41	7.78	60.53	34
Nonverbal IQ	36.54	11.75	138.06	33
Reading Attitude	65.93	18.15	329.42	30
Reading Subtests:				
Visual	5.79	0.48	0.23	34
Reference	7.23	1.16	1.35	34
Facts	12.94	1.32	1.74	34
Main Idea	5.59	1.44	2.07	34
Inference	11.32	1.68	2.82	34
Total Score	42.74	4.21	17.72	34
State Anxiety	32.22	10.50	110.25	31
Trait Anxiety	35.06	9.39	88.17	31

Pearson product-monent correlation coefficients (Popham and Sirotnik, 1973) were computed to determine the extent of the relationship between the nine variables: sex, age, socioeconomic status, self-reported health, non-verbal intelligence, reading attitude, reading achievement, state anxiety, and trait anxiety (see Table 2). Moderate correlations were noted between:

1) non-verbal intelligence and reading attitude, with the higher the non-verbal intelligence, the more positive the reading attitude ($r = .54$, $p < .01$); and

2) self-assessed health and state and trait anxiety, with the poorer the health, the more anxiety ($r = .58$, $r = .46$, respectively; $p < .01$).

Reading achievement scores correlated strongly and negatively with self-assessed health ($r = -.58$, $p < .01$), and strongly and positively with nonverbal intelligence ($r = .54$, $p < .01$). A low score on the Cornell Index reflects better self-assessed health, as the subject's score increases if he/she reports illness, anxiety, or neurotic tendencies. Subjects who reported better health achieved higher scores on the NAEP items, as did subjects scoring in the higher ranges of nonverbal intelligences.

State and trait anxiety proved to be highly correlated ($r = .75$, $p < .01$), suggesting that either 1) Speilberger's index failed to separate trait and state anxiety, or 2) since subjects completed the forms in their own homes, tasks were less threatening.

A step-wise multiple regression analysis (Kerlinger and Pedhazur, 1975) was computed to pinpoint those factors contributing significantly to the variance of aged subjects' reading achievement scores. Self-assessed health and nonverbal intelligence proved statistically significant predictors of reading achievement ($p < .01$). The two variables, when combined, accounted for 55 per cent of the variance of the reading achievement scores, while all factors, when added to the regression equation, accounted for 67 per cent of the variance (see Table 3). Chronological age, per se, was not

Table 2
Pearson Product-Moment Correlation Coefficients of Nine Variables Investigated

Variables	1	2	3	4	5	6	7	8	9
1. Trait Anxiety		.75** (31)	-.13 (31)	.24 (27)	.15 (30)	.58** (31)	-.07 (28)	.07 (30)	-.20 (30)
2. State Anxiety			-.23 (31)	-.04 (27)	.12 (30)	.46** (31)	-.23 (28)	.21 (30)	-.17 (30)
3. Total Reading				.12 (30)	.54** (33)	-.58** (34)	-.20 (30)	-.20 (33)	-.04 (33)
4. Reading Attitude					.36* (30)	.10 (30)	.15 (26)	-.29 (29)	.01 (29)
5. Nonverbal I.Q.						-.15 (33)	-.27 (29)	.01 (32)	-.30 (30)
6. Medical Index							.07 (30)	.09 (33)	.02 (33)
7. Socioeconomic Status								-.12 (30)	.37* (30)
8. Age									.04 (33)
9. Sex									

* $p < .05$
** $p < .01$

Table 3
Step-wise Multiple Regression Analysis Summary Table (Variables Predicting Reading Score)

Variable	Multiple R	R Square	R Square Change	F Ratio
Medical Index	0.58	0.33	0.33	10.27*
Nonverbal Intelligence	0.74	0.55	0.21	9.16*
Age	0.76	0.57	0.03	1.71
Trait Anxiety	0.77	0.59	0.02	3.32
Sex	0.78	0.61	0.02	1.96
State Anxiety	0.79	0.63	0.02	2.03
Reading Attitude	0.80	0.65	0.03	1.01
Socioeconomic Status	0.82	0.67	0.02	0.81

*$p < .01$

shown to be a significant predictor of reading achievement, supporting previously-mentioned studies suggesting that poor health is more closely related to mental debilitation.

Visual examination of plotted standardized residual versus predicted reading achievement scores suggested that errors were normally and identically distributed. Therefore, normality was assumed and a series of one-way analyses of variance were computed on both total reading achievement scores and subtest scores by both self-assessed health scores and nonverbal intelligence scores. (Self-assessed health scores and nonverbal intelligence scores were divided into two levels, above-average and below-average, based on percentile scores obtained on norming groups). Statistically-significant differences between the above-average and below-average self-assessed health scores and reading achievement scores were noted ($p < .03$), and between the above-average and below-average nonverbal intelligence scores and reading achievement scores. No statistically-significant differences were noted between these two factors and any of the reading subtests, which suggests that the errors were distributed evenly among subtests and did not tend to cluster.

Conclusion

Statistical analysis indicate that, for this specific sample of active, noninstitutionalized aged adults, self-assessed health (as measured by the Cornell Index), and nonverbal intelligence (as measured by Raven's Standard Progressive Matrices) were statistically-significant contributors to subjects' functional reading achievement, as measured by selected NAEP items. Sex, age, socioeconomic status, reading attitude, and state and trait anxiety level did not contribute significantly to the variance of the reading test scores.

Results of this pilot study suggest that researchers should consider development, standardization, and norming of a reading instrument designed to serve as a functional index of both reading ability and mental aging, since

chronological aging per se does not apparently, with this particular group of volunteers, affect cognitive functioning as it relates to functional reading ability.

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